REMARKS

Claims 1-25 are now pending in the application. Claims 1-24 stand rejected. Claims 1, 7, 13, 18, 19, and 21 are amended herein. Claim 25 has been added. Numerous paragraphs of the specification are amended herein. The amendment to these paragraphs is to correct typographical errors. Support for the amendment to paragraphs [0044] and [0045] is provided at least in Figure 1A and paragraph [0023] wherein valve 28 is disposed in vent line 26 prior to encountering cooling shield 24. No new matter has been added. The preceding amendments and the following remarks are believed to be fully responsive to the outstanding Office Action and are believed to place the application in condition for allowance. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 1-24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Moiseev (U.S. Pat. No. 5,226,299) in view of Raczkowski (U.S. Pat. No. 4,805,804) and claims 1-24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Varghese et al. (U.S. Pat. No. 4,988,014) in view of Raczkowski. These rejections are respectfully traversed.

Claims 1-24 are non-obvious and patentable over Moiseev in view of Raczkowski because neither Moiseev nor Raczkowski alone or in combination teach, suggest or motivate to one skilled in the art to operate a cryogenic storage tank such that the fuel is stored in a first two-phase gas and liquid state, is transitioned from the first two-phase

state to a single-phase liquid state and is further transitioned from the single-phase liquid state to a second two-phase gas and liquid state as called for in the independent claims. Claim 1 calls for:

> storing the fuel in the storage tank in a first two-phase gas and liquid state . . . transitioning . . . from said first two-phase state to a single-phase liquid state . . . transitioning . . . from said single-phase liquid state to a second two-phase gas and liquid state.

Similarly, claim 13 calls for:

> storage tank is filled with hydrogen in a first two-phase gas and liquid state . . . transitioning . . . from the first two-phase gas and liquid state to a first single-phase liquid state . . . and . . . transitioning . . . from the first single-phase liquid state to a second two-phase gas and liquid state.

Thus, in independent claims 1 and 13, the fuel stored in the cryogenic storage tank is in a first two-phase gas and liquid state which is transitioned to a first single-phase liquid state which is subsequently transitioned to a second two-phase gas and liquid state.

In contrast to the subject matter called for in independent claims 1 and 13, the Moiseev reference does not teach, suggest, or motivate one skilled in the art to transition the stored fluid from a first two-phase gas and liquid state to a single-phase liquid state nor to transition the stored fluid from a single-phase liquid state to a second two-phase gas and liquid state. Rather, the Moiseev reference discloses the storage of a cryogenic fluid 5 within a vessel 4 in a two-phase gas and liquid state. The Moiseev reference does not appear to disclose the transitioning of this two-phase gas and liquid cryogenic fluid transitioning to a single-phase liquid state as called for in the claims and Applicant can find no such teaching or suggestion. It appears that the Moiseev reference only contemplates the cryogenic fluid 5 being stored or existing in a two-phase gas and liquid state. This is evidenced throughout the specification wherein the

venting of the cryogenic fluid is specifically described as a venting of vapor through radiation shield 2. See at least column 4, lines 21-23; column 5, lines 43-45; column 6, lines 65-69 - column 7, line 2; column 8, lines 3-8 and 13-14; and Figure 1. Thus, throughout the Moiseev reference the cryogenic fluid 5 within vessel 4 is a two-phase gas and liquid fluid, and the only venting that is contemplated is the venting of a gaseous component of the two-phase cryogenic fluid 5. Moreover, with the Moiseev reference failing to teach or suggest such a single-phase liquid state, there is also no teaching, suggestion, or motivation to transition from the non-existent single-phase liquid state to a second two-phase gas and liquid state as also called for in the claims. Accordingly, it is respectfully submitted that there is no teaching, suggestion, or motivation to have the cryogenic fluid 5 within the Moiseev vessel 4 transition from the disclosed two-phase liquid and gas state to a single-phase liquid state as called for in claims 1 and 13. Moreover, there is also no teaching, suggestion, or motivation to operate the Moiseev vessel 4 such that the non-existent single-phase liquid state is transitioned to a second two-phase gas and liquid state as also called for in claims 1 and 13.

The Raczkowski reference does not overcome the deficiency in the Moiseev reference. The Raczkowski reference is non-analogous art and, thus, does not provide the motivation to transition the cryogenic fluid from the first two-phase gas and liquid state to a single-phase liquid state and then to a second two-phase gas and liquid state as called for in claims 1 and 13. To be analogous art, the reference must either be in the field of applicant's endeavor or be reasonably pertinent to the particular problem that applicant sought to resolve.

In the present case, Applicant's invention pertains to methods of operating pressurized cryogenic storage tanks. The Raczkowski reference, on the other hand, pertains to potted plant feeders that supply water to a potted plant and automatically refill with water. Potted plant feeders and methods of operating a cryogenic storage tank are not the same field of endeavor. Thus, the Raczkowski reference is not in Applicant's field of endeavor.

The particular problem being addressed in Applicant's invention is the minimizing of the quantity of cryogenic fluid that is vented from the cryogenic storage tank during storage and/or a venting operation. Additionally, the problem being addressed also includes the increasing of the quantity of cryogenic fluid that can be stored in a cryogenic storage tank of a given capacity. See page 2, paragraph [0004], lines 1-3 and 12-15 and page 3, paragraph [0005], line 1 of the present application.

The problem addressed in the Raczkowski reference, on the other hand, is the feeding or watering of plants for a period of time in an automatic manner without the requirement for personal attention in a small scale operation, such as in a home. Column 1, lines 9-15 of the Raczkowski reference. To accomplish this, the Raczkowski reference discloses the use of a container 22 which communicates with both an inlet water line 16 which includes a one-way check valve 24 and an outlet water line 18 which includes a one-way check valve 26. An electric heating element 30 for heating the water is used to heat water within container 22. A thermal switch 34 senses the temperature of the water and container 22. See column 1, lines 50-68; column 2, lines 1-5; and Figure 2 of the Raczkowski reference. Operation begins with container 22 theoretically full and the water therein at its highest temperature of 160 degrees

Fahrenheit. As the water thereupon cools, it contracts, and one-way check valve 26 is held closed thereby forming a rarefied air condition (partial vacuum) that lifts the water from the source through inlet water line 16 and through check valve 24 and into the container. As the water continues to cool, water is continually drawn through inlet line 16. When the temperature of the water reaches the lower point indicated, 90 degrees Fahrenheit, switch 24 closes and turns on electric heater 30 which heats the water. The water thus expands and holds the valve 24 closed and is forced out through the outlet line 18 and check valve 26 to the plants. See column 2, lines 26-49 of the Raczkowski reference.

The use of a heating element in conjunction with a thermal switch to automatically fill and excrete water into and out of a tank 22 is completely unrelated and not pertinent to the reducing of the quantity of cryogenic fuel vented from a cryogenic storage tank during a venting operation while the fuel is being stored nor the increasing of the quantity of cryogenic fuel that can be stored in a cryogenic storage tank of a given capacity. The Raczkowski reference is not concerned about any type of cryogenic storage, much less the minimizing of any venting of the cryogenic fluid from the storage tank nor the maximizing of its capacity. With the Raczkowski reference being so unrelated and non-pertinent to the issues of the present invention, one skilled in the art would not look to the Raczkowski reference for guidance on operating a cryogenic storage tank to minimize the quantity of cryogenic fluid vented from the storage tank nor increasing the quantity of cryogenic fluid that can be stored in the cryogenic storage tank of a given capacity.

Accordingly, Applicant asserts that the Raczkowski reference is non-analogous art and that one skilled in the art would not look to the Raczkowski reference for guidance in arriving at the subject matter called for in claims 1 and 13. As such, the Raczkowski reference does not make up for the shortcomings in the Moiseev reference.

Even if the Raczkowski reference were considered, modifying the Moiseev reference with the teachings of the Raczkowski reference would destroy the functionality of the Moiseev reference. Specifically, the Moiseev reference is concerned with the cryogenic storage of a cryogenic fluid. In cryogenic fluid storage, the influx of heat is of a strong concern and attempts are made to minimize or avoid any influx of heat into the tank. To address this issue, the Moiseev reference discloses the use of a cooling jacket or radiation shield 2 that can reduce or inhibit the influx of heat into the fluid stored within the cryogenic storage tank. The Raczkowski reference, in contrast, teaches the direct application of heat (via heating element 30) to the fluid stored in the storage tank to cause the fluid in the tank to expand and contract and to supply water to plants and to automatically refill with water for subsequent watering of plants. The direct introduction of heat through electric element 30 is in direct opposition to the purpose and intent of the Moiseev reference wherein the introduction of heat is to be avoided and/or minimized. Moreover, amended claim 1 also calls for "inhibiting heat influx into the stored fuel." Additionally, amended claim 13 also calls for "maintaining a quantity of hydrogen in the storage tank constant" when transitioning from the first two-phase state to the single-phase liquid state. In direct contrast to claim 13, the Raczkowski reference discusses and teaches the addition of water through inlet line 16 and check valve 24 when going from a two-phase state (partially full) to a theoretically

full condition (possibly a single-phase liquid state). Thus, if one skilled in the art were to be interested in operating a cryogenic storage tank, the person skilled in the art certainly would not look to the Raczkowski reference for a teaching on how such cryogenic fluids can be stored and how such storage tanks should be operated. Thus, for at least this reason, Applicant asserts that claims 1 and 13 are non-obvious and patentable over the Moiseev reference in view of the Raczkowski reference.

Claims 2-12 and 14-24 all depend from one of claims 1 and 13 and, therefore, for at least the same reasons stated above with reference to claims 1 and 13 are also patentable. Accordingly, withdrawal of the instant rejection is requested.

Referring now to the Varghese reference, the Varghese reference also fails to teach, suggest, or motivate one skilled in the art to transition a fuel being stored in a cryogenic storage tank from a first two-phase gas and liquid state to a single-phase liquid state and then to a second two-phase gas and liquid state as called for in claims 1 and 13. Rather, the Varghese reference discloses a cryogenic storage tank (Dewar) 10 in which a cryogenic fluid is stored in a two-phase gas and liquid state. Various fluid conduits communicate with the interior of the tank to allow the cryogenic fluid to be withdrawn from the tank in either a gaseous state or a liquid state. Regardless of the state of the cryogenic fluid that is withdrawn, the fluid conduits flow in/through an associated shield or heat sink that can inhibit the influx of heat into the cryogenic fluid stored within the tank. See at least column 2, lines 47-57; column 3, lines 27-33 and lines 39-51; and Figures 1 and 2 of the Varghese reference. Throughout the Varghese reference, it appears that the cryogenic fluid stored therein is maintained in a two-phase gas and liquid state. Applicant can find no teaching or suggestion that the cryogenic

fluid stored in the storage tank is transitioned from a first two-phase gas and liquid state to a single-phase liquid state. Additionally, Applicant can find no motivation in the Varghese reference to make such a transition. Moreover, Applicant can find no teaching or suggestion in the Varghese reference to transition from the non-existent single-phase liquid state to a second two-phase gas and liquid state as called for in claims 1 and 13. Additionally, Applicant can find no motivation to perform such transition from the non-existent single-phase liquid state to a second two-phase gas and liquid state.

Thus, for at least these reasons, it is respectfully submitted that the Varghese reference fails to teach, suggest, or motivate one skilled in the art to store cryogenic fuel in a cryogenic storage tank in a first two-phase gas and liquid state and transition the fuel to a single-phase liquid state and then to a second two-phase gas and liquid state as called for in claims 1 and 13.

The Raczkowski reference does not make up for the shortcomings of the Varghese reference. As stated above, the Raczkowski reference is non-analogous art and, thus, does not provide the motivation to one skilled in the art to transition the cryogenic fuel in the cryogenic storage tank in the manner called for in claims 1 and 13. Thus, it is respectfully submitted that the subject matter of claims 1 and 13 is non-obvious and patentable over the Varghese et al. reference in view of the Raczkowski et al. reference.

Furthermore, even if the Raczkowski reference were considered by one skilled in the art, the modification of Varghese et al. reference with the teachings of the Raczkowski reference would destroy the operation of the Varghese reference. The

Varghese reference is similar to the Moiseev reference in that it utilizes heat shields or sinks that are in fluid communication with the cryogenic fluid being withdrawn or vented from the storage tank to reduce or inhibit the influx of heat into the storage tank. Accordingly, the Varghese reference is specifically designed and operated to minimize the influx of heat into the stored cryogenic fluid. Thus, for at least the same reasons as stated above with reference to the combination of the Moiseev reference with the Raczkowski reference, the modification of the Varghese reference with the teachings of the Raczkowski reference would completely destroy the functionality and operation of the Varghese reference. Furthermore, as stated above, the Raczkowski reference also does not teach, suggest, or motivate one skilled in the art to inhibit influx of heat in the stored fuel nor the maintaining of the quantity of hydrogen in the storage tank constant during a transition from a two-phase to a single-phase state as called for in amended claims 1 and 13. Thus, it is respectfully submitted that claims 1 and 13 are nonobvious and patentable over the Varghese reference in view of the Raczkowski reference.

Claims 2-12 and 14-24 all depend from one of claims 1 and 13 and, therefore, for at least the same reasons stated above with reference to claims 1 and 13 are also patentable over the Varghese reference in view of the Raczkowski reference. Accordingly, withdrawal of the instant rejection is requested.

Dependent claims 2-12 and 14-24 further call for subject matter related to the operation of the cryogenic storage tanks and the transitioning of the fuel between the various two-phase states and the single-phase state. As the prior art of record fails to disclose such transitioning between the two-phase states and the single-phase state, it is respectfully submitted that the subject matter of these dependent claims further define

patentable subject matter that is not taught, suggested, nor motivation provided for in the prior art of record. Thus, for at least these additional reasons, it is respectfully submitted that the instant claims are patentable over the prior art of record and withdrawal of the instant rejection is requested.

New Claim

New claim 25 is added herein. New claim 25 calls for additional subject matter associated with the transitioning of the fuel in the cryogenic storage tank. As such, it is respectfully submitted that claim 25 further defines patentable subject matter. Notwithstanding, claim 25 depends from claim 1 and, therefore, for at least the same reasons stated above with reference to claim 1 is also patentable over the prior art of record. Thus, allowance of claim 25 is requested.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the

Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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By: _____
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